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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,865	12/11/2003	Ashutosh Misra	Serie 6128	8090
7590 Linda K. Russell Air Liquide Intellectual Property Dept. 2700 Post Oak Blvd., Suite 1800 Houston, TX 77056-5797			EXAMINER TURK, NEIL N	
			ART UNIT 1797	PAPER NUMBER
			MAIL DATE 02/13/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/733,865

Applicant(s)

MISRA ET AL.

Examiner

NEIL TURK

Art Unit

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on January 10th, 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) 1-18 and 36-44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 19-35 is/are rejected.
- 7) ☒ Claim(s) 22, 24 and 35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2/11/03 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB08)
Paper No(s)/Mail Date 9/14/06, 5/3/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Remarks

This Office Action fully acknowledges Applicant's remarks made on January 10th, 2008. Claims 1-44 are pending. Claims 1-18 and 36-44 have been withdrawn from consideration as being drawn to non-elected inventions.

Election/Restrictions

Applicant's election with traverse of group II, claims 19-35 in the reply filed on January 10th, 2008 is acknowledged. The traversal is on the ground(s) that all the claims (groups I through IV) are drawn to the same invention, with the desired result being a method and apparatus for measuring characteristics of a process chemical. Applicant asserts that as the desired result for all the groups is identical, the searching of the groups of claims should not present an undue burden on the Examiner. This is not found persuasive because of the previously discussed reasons for restriction in the Office Action mailed on December 10th, 2007. Examiner further asserts that a search of all the groups would present an undue burden.

The requirement is still deemed proper and is therefore made FINAL.

Drawings

The drawings are objected to under 37 CFR 1.83(a) because they fail to show **the portion of the transport conduit (e.g. slip stream) that is narrower than other portions of the chemical transport conduit** as described in the specification (see

paragraph [0037] of Applicant's pre-grant publication US 2004/0166584). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, **the transport conduit 130, as well as the possible locations of the slip stream must be shown in figure 5**

or the feature(s) canceled from the claim(s). No new matter should be entered. This is required with respect to claims 27-32.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities: the disclosure that pertains to the slip stream is confusing and not clearly understood through the teachings of the specification. Applicant's specification (from the pre-grant publication US 2004/0166584) in paragraph [0037] recites that the reduction and

reception of radiation in the chemical transport conduit 130 may be performed on a portion of the chemical transport conduit, e.g., a slip stream, that may be narrower than other portions of the chemical transport conduit. Applicant's specification in paragraphs [0042-0044]+ and figure 5, detail a slip stream 500 which may be placed at various locations on the chemical transport conduit 130. Figure 5 generally relates slip stream 500 to the overall system shown and does not show the transport conduit 130, nor the various locations at which the slip stream may be located. It is unclear if the slip stream is comprised of a side stream applied to a portion of the chemical transport conduit, or if the slip stream is the chemical transport conduit itself, or if the slip stream is a narrow portion within the chemical transport conduit, or if it is some combination or something else altogether. The specification further discloses that the control unit 230 may control the operation of the slip stream. It is unclear what operations the slip stream may carry out, as it appears to be disclosed as a conduit for flowing liquid.

Appropriate correction is required.

Claim Objections

Claim 22 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 22 does not further limit the system of claim 19. As claim 19 is directed toward an apparatus, claim 22

should further limit the structure of the system. Claim 22 recites an indirect reference to the capabilities of the refraction index sensor claimed and does not further limit the structure of the system, nor the structure of the refraction index sensor.

Claim 24 is objected to because of the following informalities: The recitation "refractive index" should be changed to "refraction index" so as to coincide with the previously used terminology in claim 19. Appropriate correction is required.

Claim 35 is objected to because of the following informalities: The recitation, "...comprises a plasmon surface unit..." should be changed to "...comprises a surface plasmon unit". Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 23 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a refractive index sensor capable of determining a concentration of a chemical in said process chemical based upon the refraction index, does not reasonably provide enablement for a controller capable of determining the same. The specification does not enable any person skilled in the art to which it

pertains, or with which it is most nearly connected, to make/use the invention commensurate in scope with these claims. Examiner asserts that this can be seen by the disclosure in Applicant's pre-grant publication (US 2004/0166584), in paragraphs [0037-0046], for example. Applicant's disclosure here points to the refractive index sensor further including flow cells for directing process fluid through the refractive index sensor, but flow cells alone do not provide for a refractive index sensor, such as the CCD array or surface plasmon unit would be required.

Claims 27-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The recitation to the slip stream is unclear, indefinite, and not clearly understood in view of the specification. Applicant's specification (from the pre-grant publication US 2004/0166584) in paragraph [0037] recites that the reduction and reception of radiation in the chemical transport conduit 130 may be performed on a portion of the chemical transport conduit, e.g., a slip stream, that may be narrower than other portions of the chemical transport conduit. Applicant's specification in paragraphs [0042-0044]+ and figure 5, detail a slip stream 500 which may be placed at various locations on the chemical transport conduit 130. Figure 5 generally relates slip stream 500 as the overall system shown and does not show the transport conduit 130 or the various locations at which the slip stream may be located. It is unclear if the slip stream is comprised of a side stream applied to a portion of the chemical transport conduit, or if the slip stream is the chemical transport conduit

itself, or if the slip stream is a narrow portion within the chemical transport conduit, or if it is some combination or something else altogether. The specification further discloses that the control unit 230 may control the operation of the slip stream. It is unclear what operations the slip stream may carry out, as it appears to be disclosed as a conduit for flowing liquid.

The claims further recite various pressure regulators and valves associated with the slip stream. These recitations are unclear as the sampling stream is previously recited as being coupled to a portion of the chemical transport conduit, and such chemical transport conduit has not been structurally related or established with respect to the various valves and pressure regulators. Further, it is unclear how a slip stream, which is only coupled with a portion of the chemical transport conduit includes all of the valves and regulators as shown in figure 5. Applicant's specification discloses that a slip stream may be placed at various locations on the chemical transport conduit, but the recitations in the claims appear to place it at all locations and further, require that the slip stream is the chemical transport conduit. If the slip stream is only a portion of the chemical transport conduit, or only coupled to a portion of the chemical transport conduit, how does the slip stream itself comprise the pressure regulators and valves? Examiner asserts that in looking at figure 5, it appears line 515 is the only piece shown that includes 1st pressure regulator 510 and first valve 520, and line 525 is the only piece shown that includes 2nd pressure regulator 550 and 2nd valve 530, and 3rd valve 540 appears at a junction of both lines.

Further, with regards to claims 30-32, it is unclear how a flow of cleansing agent is possible such that a source for providing such cleansing agent has not been recited in the claims.

Claim 33 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a refraction index sensor provided with a flow cell for providing a continuous liquid flow of process chemical through the refraction index sensor, wherein the refraction index sensor comprises a surface plasmon unit, does not reasonably provide enablement for a refraction index sensor comprised of a flow cell. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make/use the invention commensurate in scope with these claims. Examiner asserts that this can be seen by the disclosure in Applicant's pre-grant publication in paragraphs [0041,0042]+, for example.

Claim 35 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a refraction index sensor comprising a surface plasmon unit, composed of a metal portion, dielectric portion, and metal-dielectric interface, also including at least a flow cell for continuously providing liquid flow of the process chemical through the refraction index sensor, does not reasonably provide enablement for such a sensor as described in claim 35 without a flow cell as described. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make/use the invention commensurate in

scope with these claims. Examiner asserts that this can be seen by the disclosure in Applicant's pre-grant publication in paragraphs [0041,0042]+, for example.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear how a relevant comparison is made between a refractive index and a predetermined tolerance level. Examiner asserts that this is not a parallel comparison. A detected refractive index would have to be compared against another refractive index and then a check would be made to see if the relative difference between the two indices fell within a predetermined tolerance level. Further, claim 24 recites a predetermined tolerance level in two distinct fashions, which is unclear and not understood. It is unclear how the two predetermined tolerance levels are related. The first recitation to the predetermined tolerance level appears to be a check to see if the detected refractive index is close to a refractive index, where "close" is defined by the "predetermined tolerance level". The second recitation to the predetermined tolerance level references the chemical state of the process chemical, and this recitation does not appear to be concerned with a predetermined tolerance level, but more to a qualitative result of "good/acceptable" (for the case of the RI falling within the tolerance level), "bad/unacceptable" (RI does not fall within the tolerance

level) with respect to the overall process chemical. However, as currently recited, the controller and its recited functionalities are unclear and indefinitely recited.

Claim 33 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: a CCD array capable or a surface plasmon unit. It is unclear how a refraction index sensor is comprised of a flow cell. A flow cell alone will not provide for refractive index measurements.

Claim 35 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: a flow cell for providing a continuous liquid flow of process chemical through the refraction index sensor. Examiner asserts this can be seen in paragraph [0040], for example.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 19-23 and 27-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanell et al. (6,267,641), hereafter Vanell.

Vanell discloses a method of manufacturing a semiconductor component and a chemical-mechanical polishing system. Vanell discloses supply tanks for the CMP slurry, coupled to pumps 171 and 172 (abstract, lines 15-26, col. 4, fig. 1). Vanell further discloses an output port 113 connected to a channel with a flow rate sensor 160. Vanell discloses vessel 110 (process chemical unit, providing the mixed slurry for

processing a semiconductor wafer), as well as a refractometer 150 (chemical analysis unit) and an output port 113 (process chemical transport conduit associated with the piping thereformed) (lines 28-67, col. 2+, figures). Vanell also discloses that the CMP system 100 may also include a carrier assembly for supporting a semiconductor substrate, as well as a platen (carrier and platen function as the processing tool to perform a function on the substrate) for mechanically polishing the semiconductor. Vanell further discloses measuring the concentration of hydrogen peroxide (limited lifetime due to decomposition into oxygen and water) in the CMP slurry by measuring the refractive index of a portion of the mixture (measured index of refraction is directly and linearly proportional to the concentration of the first component in the mixture) with refractometer 150, as it passes slurry sensing port 114. Vanell also discloses that the refractometer 150 provides a second signal to adjust the flow rate of the first component of the CMP slurry. Vanell discloses that this fast, automated, and in-situ measurement provides a more accurate measurement of the concentration of the first component than a slow titration process(step 230; line 29, col. 2 through column 5, figs 1&2). Vanell further discloses that the refractive index measurement of the first component at step 230 is subsequently used in feed back control to dictate a second injection rate for the first component of the mixture, and thus dictates the requisite make-up of the polishing mixture (col. 5&6, fig. 2). Examiner asserts that Examiner asserts that using the optically detected concentration of the first component to determine a second injection rate for the first component constitutes determining whether a chemical state of the process chemical (concentration of first component, i.e. hydrogen peroxide) is within a

predetermined tolerance level in an online manner in response to the refraction index. Examiner asserts that using the measured concentration (from refraction index) to calculate a second injection rate inherently shows a determination of whether the chemical state (concentration) is within a predetermined tolerance level (proper mixture) such that a known concentration is sought after in order to make the final mixture for use in polishing the substrate (lines 18-22, 49-56, col. 1). Examiner further asserts that as Vanell discloses an automated an in-situ process, a controller is implicitly recited within the device for carrying out the recited functions and steps.

Vanell does not disclose that the chemical analysis unit performs an analysis of the process chemical in the process chemical transport conduit.

It would have been obvious to one of ordinary skill in the art to modify the Vanell device to move the refractometer from its position at sensing port 114 to a position with respect to the output port 113 and its conduit such that this is an obvious change of location of the refractometer, in which the refractometer would still be able to detect refractive index and thus concentration of the component in an automated and in-situ fashion for the desired purpose of updating the required amount/flow of the first component to make the desired slurry, such that the transport conduit carrying such slurry is located before (upstream of) the processing tool.

If the Vanell device is not taken to have an implicitly recited controller for carrying out the automated, in-situ measurements/processes, than it would have been obvious to modify Vanell to include a controller such that a controller is well-known for

accomplishing automated processes and feed-back control operations, such as desired by Vanell.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vanell in view of Shiraishi et al. (5,501,870), Shiraishi.

Vanell does not specifically disclose a controller adapted to compare the refractive index to a predetermined tolerance level stored in a library to determine if the chemical state of the process liquid is within a predetermined tolerance level.

Shiraishi discloses an apparatus for applying a hydrophobic treatment to a semiconductor wafer in which a concentration of the HDMS treating liquid is monitored and supplied to CPU 5 for comparison with a predetermined reference value. Shiraishi further discloses that based on the comparison, the CPU 5 controls the temperature control section so as to control the temperature of the supporting table for a desired treating temperature, so as to coincide with the change in HDMS concentration (abstract; lines 17-28, col. 7, fig. 2). Shiraishi thereby discloses monitoring a parameter in the processing of a semiconductor wafer and comparing such a measured parameter for the purpose of controlling the overall processing of the wafer to the desired standard.

It would have been obvious to modify Vanell to have a controller adapted to compare the relevant parameter (refractive index, and thereby first component concentration, as related to Vanell) to a predetermined reference value for the purpose of determining the chemical state of the process chemical such as taught by Shiraishi in

order monitor the relevant parameter in order to dictate or control the overall processing of the slurry, which is thereby applied to process the wafer properly.

Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vanell in view of Luger (4,012,199).

Vanell has been discussed above.

Vanell does not specifically disclose a temperature sensor to determine a temperature of the process chemical.

Luger discloses a temperature sensor 200 for determining the temperature of a process liquid so as to help maintain it at a proper temperature (columns 13, 14, &21, fig. 17).

It would have been obvious to modify the Vanell device to include a temperature sensor for determining a temperature of the process chemical such as taught by Luger in order to provide means for indicating the temperature of the process liquid so as to provide indication that the process liquid is in a satisfactory temperature for the assay.

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vanell in view of Ono et al. (4,943,725), hereafter Ono.

Vanell has been discussed above.

Vanell does not specifically disclose a charge coupled device for detecting the refraction index.

Ono discloses a radiation read-out apparatus in which the reading light reflected and modulated in accordance with the distribution of light refractive indices is received by a two-dimensional charge-coupled device (lines 1-50, col. 3).

It would have been obvious to modify Vanell to include a charge-coupled device such as taught by Ono in order to provide a known means for receiving radiation in order to achieve the desired refractive index measurement.

Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vanell in view of Molloy (6,245,578).

Vanell has been discussed above.

Vanell does not specifically disclose a surface plasmon unit as a refractive index sensor.

Molloy discloses such SPR sensors as being well known and conventionally used for measuring refractive index (lines 9-17, col. 1+).

It would have been obvious to modify the Vanell device to utilize a surface plasmon unit as a sensor for measuring refractive index such as taught by Molloy so as to provide a known means for achieving the desired refractive index measurement.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NEIL TURK whose telephone number is (571)272-8914. The examiner can normally be reached on M-F, 9-630.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 571-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NT

/Jill A. Warden/
Supervisory Patent Examiner, Art Unit 1797